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FOREST INSECT INVESTIGATIONS

FOREST INSECT CONTROL PROJECT
KOOTENAI NATIONAL FOREST

Report for the Season of 1929

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INTRODUCTION

This report is prepared as a means of submitting a full and final account of the 1929 insect control operations and the result of the past season's insect reconnaissance. This report will cover both the spring and fall operations, showing the costs of both projects. As the writers feel that this project should and probably will be continued, it seems desirable to include a brief history of past work, plan of control, etc., as a matter of convenience to the reader.

HISTORY OF PROJECT

For sometime prior to the institution of control measures it had been known that there was considerable insect damage taking place in the upper drainages of the Yaak River. This damage was confined principally to white pine and lodgepole pine and was due to the attacks of the mountain pine beetle (Dendroctonus monticolae). Surveys made in 1925 showed the rate and intensiveness of spread in some drainages to be sufficient cause for alarm. Though a severe epidemic condition of the mountain pine beetle in lodgepole pine existed a few miles to the north, it was believed that the institution of control in the Pete Creek

drainage, as an experiment in protecting the white pine of that region, was a justifiable step. During the spring of 1926 and 1927 control work was instituted within the Pete Creek drainage as an experiment for the protection of the white pine. However, in 1927 it was rather evident that the white pine of this area was being reinfested from the severe lodgepole epidemic to the south. Surveys conducted during the 1928 season showed infestations to be present in other drainages of the Forest. The lodgepole pine of Garver Creek, a tributary to the West Fork of the Yaak, was badly infested, and the losses in white pine within the O'Brien Creek drainage, a tributary to the lower Yaak, were becoming especially heavy.

As only limited funds were available for control during the spring of 1928 it was decided to again institute control measures within the Pete Creek drainage and to clean up as much of the O'Brien Creek infestation as possible. A good clean-up was accomplished on Pete Creek but funds permitted treating only a portion of the infested trees in O'Brien Creek. Surveys conducted in 1928 showed that the infestation on the Garber Creek drainage was still in a severe epidemic status, and that conditions in several other areas had reached serious proportions.

Surveys in 1928 also showed considerable infestation springing up within several drainages tributary to the Kootenai River. Especially were Bear Creek, Upper Quartz Creek, West Fork of Quartz Creek, and some portions of Bobtail Creek found to be rather heavily infested. Seventeen Mile Creek, which drains into the Yaak, was heavily infested near the upper limits which lie immediately over the divide from the head of the

main or Upper Quartz Creek. O'Brien Creek also contained an increased infestation. Most of the infested trees were white pine, although some were lodgepole and a few yellow pine.

During the spring of 1929 control work was conducted in O'Brien, Bear, and Bobtail Creeks, and the West Fork of Quartz Creek. Further work within the Pete Creek drainage was abandoned at this time as it was very evident that each year the area was being reinfested from the severe epidemic in lodgepole which now practically bordered the area to the north. During the fall of 1929 control work was again instituted in Bear Creek and, for the first time, in the main or Upper Quartz Creek drainage.

CHARACTER OF THE INFESTATION

The earlier infestations starting within the Yaak River drainage have continued with increasing intensity, resulting in a severe epidemic on some of the side drainages. Garver Creek has been so severely hit that the stand of dead lodgepole pine now appears similar to a stand destroyed by fire, as most of the trees have been killed. Proceeding southerly from Garver Creek for a few miles the infestation decreases in intensity, giving way to more scattered groups of infested trees, and further on the intensity is reduced to more scattered and isolated infested trees with a few small groups.

Several other side drainages are also rather heavily infested. It is possible that the infestation is spreading for rather long distances from the Upper Yaak areas into regions adjacent to the Kootenai River, though this is very doubtful. Regardless of this possibility it is believed that the infestation within the Bear Creek drainage, which lies south of the Kootenai River, either originated within the area or came from some other source.

It lies at considerable distance, probably 20

miles from the nearest of the other infested areas, and it is assumed that this outbreak may have developed within a heavy blow-down of white pine which occurred on a small portion of this drainage in 1924.

ENTOMOLOGICAL PLAN OF CONTROL FOR 1929

Planning control measures for the reduction of the rather widespread insect outbreaks which were present within the Kootenai Forest was a rather difficult task. Outbreaks of the mountain pine beetle existed in practically all of the white pine stands of the Forest and the infestation in the lodgepole pine stands of the Upper Yaak was still in a severe epidemic status.

In planning control with the limited funds available it was thought best to concentrate upon the protection of the more accessible white pine stands. Such a plan eliminated all thoughts of controlling the epidemic in the lodgepole stands within the drainage of the Upper Yaak. Such action was necessary as a large sum of money would have been required for the treatment of all the infested trees, and previous experience with other outbreaks of this character seemed to indicate the inadvisability of attempting to check such an outbreak with a barrier plan of control. It seemed desirable to accomplish a thorough clean-up of infested trees on O'Brien, Bear, Bobtail, Upper Seventeen Mile, Upper Quartz Creek and the West Fork of Quartz Creek. It was estimated that this would cost about \$25,000. Seventeen thousand dollars was allotted for the work. It was decided to use this allotment in control on areas given below in order of priority.

1. Bear Creek
2. West Fork Quartz
3. O'Brien Creek
4. Upper Quartz Creek
5. Seventeen Mile Creek

There were a few scattered trees outside these areas and some infestation of the Bobtail Creek sale area which were given high priority. Control measures were instituted as follows:

1. Bear Creek was cleaned up.
2. West Fork of Quartz was cleaned up.
3. O'Brien Creek was nearly cleaned up.
4. Upper Quartz was untouched.
5. Upper Seventeen Mile was untouched.
6. Scattered trees in Star Creek and infestation on Bobtail sale area were treated.

This gives a brief line-up of the spring work accomplished. For the institution of control work in the fall of 1929, \$6,000 was allotted. O'Brien Creek was now dropped because a sale of the timber in this drainage had been consummated. It seemed desirable to work the areas cleaned up during the past spring in order to again clean up the scattered attacks occurring this season. It also seemed extremely desirable to clean up the Upper Quartz and Seventeen Mile areas. With the funds available the different areas were covered as follows:

1. Bear Creek, again cleaned up.
2. West Fork of Quartz, no work done.
3. O'Brien Creek, no work done.
4. Upper Quartz Creek, cleaned up.
5. Upper Seventeen Mile, no work done.
6. Other areas, no work done.

1929 SPRING CONTROL OPERATION

A preliminary report covering 1929 spring control operations on the Kootenai Forest was submitted June 13, 1929, by Ed Henrichs and C. S. Webb. At that time complete cost and production records were not available.

More detailed records of costs and production are given herein, although the costs are not materially changed.

The job was conducted by Lumberman Ed Henrichs of the Kootenai Forest and C. S. Webb of the Office of Management, D-1, as a forest project under Supervisor Jefferson. D-1 Forest Officers R. J. Smith, E. P. Morris, and A. B. Bowman assisted with the work, acting as chief spotters and camp managers. J. C. Evenden, Entomologist, Bureau of Entomology, visited the various units, inspected the work and extended valuable advice in the interest of better and more efficient spotting and control work. Supervisor Jefferson and Assistant District Forester Koch inspected the work during the course of operations.

The areas worked consisted of Bear Creek drainage within T. 28 N., R. 31 W., West Fork of Quartz Creek within T. 32 N., R. 32 W., O'Brien Creek within T. 32 N., R. 33 W., Bobtail Creek within T. 32 N., R. 31 W. M.P.M. A few scattered trees were treated in T. 32 N., R. 34 W., near the O'Brien road and 31 trees in Star Creek. These areas are within the Kootenai National Forest, Montana, and are shown on a map which forms a part of this report.

The equipment used on this project was taken from insect control stock at the Spokane warehouse. Equipment and food supply were concentrated at the Libby and Troy warehouses during March and April. The Kootenai Forest trucks were used at cost of operation for the greater part of the hauling. Some truck hire was necessary. The packing was done with the use of Kootenai pack stock at the expense of feeding only.

On April 22 a few men were put to work repairing roads and trails, and moving out and setting up camps. The first spotting was commenced May 1 and treating, May 2, on the West Fork of Quartz Creek. Spring opened up late, cold stormy weather continuing along well toward the end of May. Considerable snow shoveling of roads and tent settings was necessary in order to get started as early as possible. Snow hung on making spotting difficult and slow. About May 8 the crew had been built up to 80 men at which number it was maintained up to June 5 when the West Fork of Quartz was completed. About 55 men continued on to June 10 when work was discontinued owing to the end of available funds being near.

Little trouble was experienced in securing laborers in sufficient numbers. Probably close to 80 per cent were of the floater class and were hired at Libby and Troy. The remainder were local men and a few outsiders who follow up this work each season. The floater class usually stays only long enough to accumulate a small road stake and naturally the turnover was very large. This is a factor tending to increase costs quite materially. In order to maintain an average crew of 80 men for 35 days, securing about 2800 man days' work, 178 men were hired. This represents a turnover of about 222 per cent. No labor troubles were experienced and fortunately there were no fatalities, serious injuries or damage to private property during the course of this operation.

The central office of the project was located at the Supervisor's headquarters at Libby, Montana. The forest staff of clerks absorbed most of the additional clerical work, it being necessary to employ but one additional man at Libby who did the local buying, and filled orders from camps for men, supplies, and equipment.

Five hundred twenty horse days were spent on the job, as follows: 423 days for pack horses; 33 days for saddle horses used on pack strings; and 14 days for team horses doing some hauling of equipment and supplies and road repair work. Cost of saddle and pack horses involved only their feed. They had to be fed up for a considerable time before work commenced and the total cost amounted to 43¢ per day for the actual time used.

Three thousand one hundred ninety-five man days were employed on the spring project, 66 days of which were contributed time. Figuring salary and expense of contributed time as an actual cost, as well as all those paid from the allotment, the total cost of preparation, transportation, horse hire, maintenance of horses, labor, man subsistence, equipment and supplies and miscellaneous expense was at the rate of \$5.30 per man-day. Production was at the rate of 1.08 trees per man-day, making a gross cost of \$4.91 per tree on this basis.

The cost of boarding men at the camp based on 9,692 meals served was \$0.402 per meal. This includes subsistence supply costs of \$0.276, transportation of same \$0.025, and wages of kitchen men \$0.101.c Detailed production records and costs are given later in this report.

A. Organization

Libby, Montana, the Supervisor's headquarters, was selected as the central point from which the project could be administrated as the Forest office and warehouse are located at this point. This operation was a Forest project under the direction of Supervisor Jefferson. The central overhead force consisted of C. S. Webb in charge, Ed Henrichs as assistant

in establishing camps and field supervision and J. F. Shields a temporary man who acted as a supply man filling orders from camps for men, supplies and equipment. The Supervisor's clerical staff absorbed the book-keeping, vouchering and paymaster work. The Forest's regular truck drivers were employed only on the days when these trucks were in use on the insect control work.

The field area was divided into three units. The West Fork of Quartz Creek Unit had one camp with Forest Officer E. P. Morris in charge. Morris acted as a chief spotter and camp manager and had a temporary foreman in charge of the treating crews. The Bear Creek Unit was similarly organized with A. B. Bowman in charge of that camp. The O'Brien Creek Unit was organized with two camps. Ranger Howard McGill of the Kootenai took charge of one and Tom Terrell, a temporary man, was placed in charge of the other. McGill soon left to take up other work and his camp was turned over to Ranger R. J. Smith for a short time, then being taken over by Henrichs who was supervising the whole unit. After completing work on the Bear Creek Unit, Bowman moved his camp to this unit which made a total of three camps with four settings on this area. The men employed at Bobtail and Star Creeks did not have regular camps established, those at Bobtail boarding at a brush camp and those in Star Creek taking in a small spike camp. At least one spotting crew was placed at each camp but the most of them had two such crews. There was one treating-crew foreman at each camp with from 12 to 20 men. These were divided into several smaller working crews.

B. Spotting

Spotting was done on all areas except the pick-up work on the Cabinet district and the Bobtail sale area. The spotting was done by a 100 per cent strip survey. Crews were organized consisting of one chief spotter and two spotters. The chief spotter ran parallel compass lines from his control which were about four chains apart. One spotter on either side of him worked a strip 2 chains in width in search of infested trees. The chief spotter made a rough drainage map and was responsible for the work of his crew. Each crew was given a serial symbol as A, B, C, etc., and each man carried a hand axe, ~~takes~~, cloth tags 4"x6", and crayon. All infested trees found were blazed and a cloth tag tacked thereon bearing the crew symbol and consecutive number of the tree for this crew, i. e., Crew "A" marking its 33d tree would show "A-33", thus affording a means of checking up the work done by a given crew. The chief spotters' maps shows the approximate location of the tagged trees by numbers or groups of infested trees by inclusive numbers contained in the groups, and the treating crew foreman can later take the maps and find the trees with little difficulty. Three temporary men were employed as chief spotters and three forest officers, making 6 crews during a portion of the time the job was in operation. 3,036 trees were spotted. Costs of this work were high owing to scattered attacks, steep, rough, brushy country and a large part of the work being done on poor travelling through snow.

C. Treating

After deducting the spotting crews, foreman and kitchen men from the

20 to 25 effective men in each camp, there would remain 12 to 18 men for treating work. The foreman had direct charge of all the men working at treating, regardless of how many individual small crews he had divided them into. It was common in picking up scattered small groups or isolated trees to use three-man crews. These were equipped with 1 saw, 2 axes, 1 wedge and hammer, 1 light canthook, and 3 peeling spuds. Occasionally two men constituted a crew, but this was seldom since the amount of tools necessary to carry made the three-man crew more practicable, especially where trees were not very far apart. In large groups involving 12 to 15 trees, it proved practicable to work 5 to 6 men in a crew since one gang of sawyers would fell the whole group in a short time and if care was used in felling so as to not to cover the first ones with brush, the whole crew could be kept busy peeling until the group was completed. In areas of several acres of heavy infestation it was possible to work two saws and a dozen men following up with the peeling. The saws would move from place to place on such an area so as to not bury an unpeeled down tree with a newly fallen one.

From time to time certain areas were assigned to the crew foreman by the camp manager. Taking the map prepared by the chief spotter, and using a pocket compass, the foreman was able to locate and treat the infested or spotted trees. The trees were all felled, cut into lengths 24 to 48 feet, depending on size, so that they might be rolled with canthooks. The stumps were peeled as well as the entire infested length of

the hole. The majority of trees treated were white pine. There were some lodgepole and a few yellow pine. The yellow pine which were infested with the western pine beetle were felled, about 1/3 the bark surface on the top side of the prone tree was spudded off, and fire built along either side of the tree burning the remainder of the bark. During the spring operation the lodgepole and white pine were peeled. White pine trees were often infested to a four or six inch top. Peeled lengths of some trees ran as long as 150 feet and there were very few under 70 feet. D.B.H. measurements ran from 10 to 40 inches, the average white pine being about 22 inches.

Entomologist J. C. Evenden, in an inspection of the Bear Creek Unit subsequent to the completion of spring control work, criticised the treating work because an unnecessarily large number of infested tops and under sides of logs were not peeled. Instructions to camp managers and crew foremen were that trees were to be peeled as far up as larvae existed. In inspection during the operation it was occasionally found necessary to send foremen back to peel out such tops. It is felt that on an area such as Bear Creek where a clean-up is the plan, no larvae should be left in the tops. The infestation at the tops usually is light and amount of surface small in comparison with the whole tree, yet a few larvae exist in all such tops. On an area where it is known a thorough clean-up cannot be made because of physical reasons or inadequate funds, it is felt the leaving of these lightly infested portions in order to secure a much larger surface of heavier

infestation would be the correct thing to do. These trees peel comparatively easily from the butt up to the first limbs. From the first limbs peeling becomes more tedious and difficult as one progresses toward the top. Usually after an 8" top is reached the bark is thin, the sapwood dry, and bark adheres tightly to the wood. Peeling of these is extremely slow and tedious. On a clean-up job unquestionably they should be destroyed.

It is believed worth while to try burning such tops in a peeling operation at all times when burning can safely be done. The tops usually break up into chunks from a diameter of 8 or 10 inches. If they do not break, they are easily chopped into lengths suitable for handling and piling. Especially in the case of infested groups where a number of tops are available, it is believed if these are piled up and a part of the top slash piled with them they can more easily and economically be piled and burned than they can be peeled out. If burning is unsafe, then on thorough clean-up areas they should be peeled out, though it may sometimes be necessary to use a draw shave or some tool of that nature. The methods used in piling and burning the whole tree will be later discussed under the account of the fall control operation.

Stress placed upon the amount of bark surface peeled per man-day as a measure of production may sometimes result in inefficient work. Stressing the idea to our camp managers and crew foremen that it is expected they produce some certain amount of work per man-day

in terms of bark surface peeled, tends to build up a bucking board idea, resulting in each foreman attempting to beat the other in terms of bark surface per man-day, which often may cause him to disregard the standard of the work he is doing. In other words, it is believed on thorough clean-up areas we should place much stress on quality and less stress on quantity of work.

A tabulation, "Man-day Record", follows, which shows the total distribution of time spent at the different camps. This is direct camp time only and does not include overhead and transportation.

A second tabulation, "Production Record", shows the number of trees spotted and number treated by units and the production by number of trees and bark surface per actual effective man-day, as well as on the basis of total camp days. This also eliminates overhead and transportation

MAN-DAY RECORD
SPOTTING AND TREATING CHTS
 Does not include time of overhead and transportation.

<u>Name of Unit</u>	<u>Bear Creek</u>	<u>L.Fork Quartz</u>	<u>O'Brien Creek</u>	<u>Bobtail Creek</u>	<u>Cabinet District</u>	<u>Job Total</u>
<u>Unit Manager</u>	<u>Bowman</u>	<u>Morris</u>	<u>McGill, Smith, Harrington</u>	<u>Shridge</u>	<u>Waylett</u>	
<u>Item</u>						
1. No. Trees Treated	407	572	1965	462	36	3442
2. No. Meals Served	1228	2640	5742	196	82	9888
3. Days Moving Camp	9	15	50-48	0	6	70-1/8
4. " Establishing Camp	30	49		3	2	175
5. " Fire Suppression	1	0	0	0	0	1
6. " Cutting Wood	6	10	22	0	0	38
7. " Cooks	223	44	99	0	0	165
8. " Windrows	21	44	92	0	0	157
9. " Saw Filler	0	6-5/8	11	0	0	18-3/8
10. " Roads and Trails	1	16	7	0	0	24
11. Effective Days Spotting	41	84	164	0	2	291
12. Noneffective " "	6	5	12	0	0	26
13. Total " "	47	92	176	0	2	317
14. Effective " Treating	243	408-5/8	1149	52	23	1876-5/8
15. Noneffective " "	100	222	396	0	0	718
16. Total " "	343	630-5/8	1545	52	23	2595-3/8
17. " all Days	390	722-5/8	1722	52	23	2912-7/8

Note: 3 to 10 inclusive = 12 + 15.

$$17 = 13 + 16$$

PRODUCTION RECORD

Shown both on effective and total man-day basis.

SPOTTING

Unit	Manager	No. Trees Basis	No. Trees per effec. Man-day	No. Trees per man-day Total Days
Bear Creek	Bowman	407	9.9	8.7
W. FK. Quartz	Morris	578	6.9	6.3
O'Brien Creek	McGill-Smith Henricks	2051	12.5	11.6
Bobtail Creek	Akridge	No spotting activity on this unit.		
Cabinet Dist.	Waylett	" " "	" " "	
Job	Total	3036	10.5	9.6

TREATING (Tree Basis)

Unit	Manager	Number of trees treated.	Trees treated per effective Man Day	Trees treated per total Man day.
Rear Creek	Bowman	407	1.7	1.2
W. F.K. Quartz	Morris	572	1.4	.9
O'Brien Creek	McGill, Smith Hendrick	1365	1.7	1.3
Bobtail Cr.	Akridge	* 462	8.7	8.8
Cabinet Dis't.	Waylett.	36	1.5	1.4
		2980	1.6	1.2

TREATING (Square foot bark surface basis)

Unit	Manager	Square feet bark Surface treated.	Square feet Bark Surface Peeled effective Man Day	Square feet Bark Surface Peeled total Man Days.
Bear Creek	Bowman	132.039	543	385
W. F.K. Quartz	Morris	129.007	316	205
O'Brien	McGill, Smith Hendrick	748.331	651	484
Bobtail Cr.	Akridge	*49.772	948	948
Cabinet Dis't.	Waylett	11.801	502	502
		1.021.178	559	401

*Note: The Bobtail operation is left out of the above totals since it does not represent an average in common with the other camps. The Bobtail job consisted only of peeling cull material already cut down in a logging operation. The total, for the purpose of getting a true average, is therefore figured on 2980 trees rather than 3442, and 1.021.178 square feet of bark surface rather than 1.070.950.

In reviewing this man-day record the working conditions affecting each unit must be given due consideration. The mere fact that a certain unit ran below the average in production does not necessarily mean it was below the average in efficiency or was poorly managed.

The Bear Creek Unit had one camp setting and is considered the easiest to work. There was considerable walking to and from some of the work but the topography is easy and the timber a convenient size to handle well. No pack stock was needed, supplies and equipment being hauled directly to camp on trucks. The area is not above the average in brush conditions.

The West Fork of Quartz Creek is considered the most difficult unit. A very poor road leads nearly to the mouth of the West Fork from whence equipment and supplies were packed about $2\frac{1}{2}$ miles to camp. This area had one camp setting. Attacks were very scattered, few small groups and the infestation extended back up the steep slopes a long distance from creek and camp. The area is steep, rough, and very brushy.

O'Brien Creek is a fairly easy area to work. A poor road leads in from Troy, a distance of 12 miles, from whence equipment and supplies had to be packed to the camps $2\frac{1}{2}$ to 6 miles. This area had four camp settings. Groups of infested trees were relatively large, topography fairly easy and brush conditions average. This area is considered next to Bear Creek in this respect. Considerable road and trail work was necessary in working this area.

Bobtail Creek Unit was very easy to work but is not to be compared with the other units in any output figures. The work here consisted of going over the Bobtail sale area where the timber had been cut the previous season and peeling infested portions of trees lying upon the ground. No spotting was required. But few trees were felled. The infestation was principally contained in the prone holes of cull trees and long butts or cull logs of white pine left in the woods by the loggers. The work was nothing much but a peeling proposition and this material peeled easily.

Cabinet District was a case of pick-up of a few scattered trees, mostly in Star Creek. These were cut and peeled by three men using a spike camp and doing their own cooking. No spotting crew was used, these men doing their own scouting. This part of the work is not comparable in production to the first three units.

As an indication of progress made in the treating work, covering the whole job, the following is given:

<u>Period Ending</u>	<u>Trees Treated per week</u>	<u>Trees Treated Job to Date.</u>
May 4	154	154
" 11	324	478
" 18	557	1035
" 25	576	1611
June 1	729	2340
" 8	899	3239
" 15	203	3442

The trees averaged 22 inches in diameter breast high and the length treated averaged 74 linear feet per tree.

D. Costs

Next to the successful treating of an infested stand so as to bring about the greatest reduction in the numbers of the beetle, the matter of costs seems the most important matter for consideration.

The cost of spotting and treating the trees, based on the effective man-days worked by the crews at camp, constitutes only a portion of the total cost. Various items of other expense enter into the total. A large amount of tools and camp equipment is necessary; camps must be moved out and set up; tools sharpened and repaired; roads and trails repaired and opened up; horses required which must be maintained on hay and oats; fuel; cooks' wages; freight; express; telephone bills; transportation necessary in moving and supplying camps; travel expense and overhead men needed in handling the job. Spring work which is started when weather, snow and road conditions are bad, is especially costly.

After a rather brief account which follows, covering the fall 1929 work and methods used, a number of tabulations pertaining to production and costs are given. In the tabulations are figures under one column pertaining to the corresponding figures for the spring of 1929, and in order that ready comparison may be had the corresponding figures for the fall of 1929 are carried out to the right of the spring column.

FOREST PERSONNEL AND COOPERATION

During the 1929 spring operation, the following forest officers were assigned to the job besides Webb and Henrichs; R. J. Smith, Ranger, Madison Forest; E. P. Morris, Junior Forester, Madison Forest; A. B. Bowman, Junior Forester, Missoula; and Howard McGill, Ranger, Kootenai Forest, was on the work for a short period. These men all worked sincerely and to the best

interests of the project. The clerical force of the Supervisor's office, R. W. Strong, Mrs. Byers and Miss Nicholson each absorbed portions of the added work and handled it agreeably and efficiently. Rangers Gregg, Williamson, Byers and Woods, in whose districts work was done, each extended liberal cooperation.

1929 FALL CONTROL OPERATION

Report of Fall Experimental Control

An appropriation of \$6,000 was allotted to the Kootenai Forest for insect control for fall work in 1929 which with a \$600 warehouse credit from the 1929 spring job, making a total of \$6,600. The plan for fall work was to make a 100 per cent clean-up of Bear Creek, Upper Quartz and as much on Seventeen Mile as funds would permit.

One camp was moved to Seventeen Mile and one to Upper Quartz with supplies and equipment for 25 men each, and one camp to Bear Creek equipped for 12 men. After spotting a part of Bear and Upper Quartz Creeks, it was found there would only be sufficient funds for Bear and Upper Quartz Creeks.

To determine the effectiveness of fall control work in white pine as against that of spring operations, an appropriation of \$6,000 was allotted to the Kootenai National Forest for the institution of insect control during the fall months of 1929. This project was to be instituted purely on an experimental basis in the hope of developing or improving our technic of control so as to subsequently lower its cost. It was realized that the trees would peel much harder in the fall of the year than during the spring months, but it was thought that perhaps the decreased cost of transportation,

establishment of camps, etc., would more than offset this handicap. In spring operations the cost of transportation, establishment of camps, etc., is one of the heaviest items of expense, and the purpose of this experiment was to determine if some method of satisfactory fall treatment could be developed which would eliminate these heavy items of expense and subsequently lower the cost of control. There is no need to discuss the advantage of fall control relative to the issue of transportation, setting up of camps, etc., though even at this season of the year the same class of camps is necessary as for spring operations in order to insure proper living conditions for men.

By the time the project had been under way a few days it was very evident that the peeling of the infested trees would be an uneconomical procedure. The bark adhered very tightly to the wood and it was necessary literally to gnaw it off the logs with the peeling spuds. It was impossible to secure pieces of bark more than two or three square inches in Area. Mr. Ivenden, Forest Entomologist, was present at this time and even before this fact was evident had planned to test the possibilities of skidding the infested logs into decks with horses for burning, and tests were already under way. The result of these tests, though not entirely satisfactory, showed that burning was a far more efficient and economical method of treating than peeling, so was adopted throughout the project and peeling was abandoned, except for isolated trees. The Seventeen Mile camp was combined with Upper Quartz, making this into a 40-man camp. This resulted in an unnecessary expense, but under the circumstances it could

not be helped. Two teams of logging horses for skidding were hired at \$40 per month from a local lumber company. J. C. Evenden, Entomologist, Bureau of Entomology, and Supervisor F. J. Jefferson visited both the Bear and Upper Quartz Creek units at the beginning of experimental control and assisted in organizing crews for the work.

Upper Quartz Creek

The white pine in this drainage consists of large mature timber along the creek and side draws, with young white pine and lodgepole on the side hill and ridges. The spotting was done by Ranger S. T. Billings, chief spotter, and two temporary men who made a 100 per cent survey of the white pine and lodgepole type. During the first six days of treating the peeling method was used. This was found to be slower and more expensive than spring peeling owing to the bark adhering to the wood. There were several clumps of 1929 attacks consisting of large white pine averaging 24" D.B.H. along the creek bottom and side draws where the ground was fairly free from windfalls and underbrush. These areas were selected for skidding and decking with teams. From one to 5 trees were skidded to each deck, small decks being made in order to shorten skidding distance. A crew of six men was used for each team after the timber was felled and bucked into log lengths. The crew consisted of 1 teamster, 2 swampers, 2 deckers, and 1 straw boss capable of doing any part of the work. If future work of this sort is undertaken it is recommended the crew size be reduced to 5 men, eliminating one man on the deck.

Due to making small decks in order not to scorch live trees and to eliminate long skidding distances, only one team can be worked to advantage in each crew. In order to get accurate cost data of different phases of

the work of burning, peeling, and hand logging methods of control. Tom Terrell, employee of the Bureau of Entomology, was placed in charge of costkeeping. A crew consisting of one straw boss and three laborers was used in treating the scattered and isolated trees where it was impractical to use teams. These trees were hand-logged into a pile and burned. By felling the trees uphill fairly large trees can be hand-logged by dragging the top logs down and placing them along the side of the butt cuts. Some trouble was experienced in burning the deck by fire creeping in the duff and spreading to the live trees. A Pacific pump with 1,000 feet of fire hose was placed in the creek and the ground thoroughly wet down before setting fire to log decks.

Organization.

The camp organization was practically the same as in a lumber company camp. Ranger C. A. Fenn was in charge of treating and Camp Foreman and Ranger S. T. Billings were in charge of spotting, keeping all records and reports up to date, keeping time and commissary clerk. Tom Terrell was in charge of costkeeping and experimental control be activities.

Bear Creek

Control was instituted in this drainage in the spring of 1929, this fall's control being a follow-up of last spring's work. In the spring control 407 trees were treated, the following fall 309 trees were treated, which would appear a much heavier reinfestation than should follow control work. This reinfestation was due to tops not being thoroughly peeled during the spring operation and to the fact that a larger area was covered.

The fall operation included a part of Little Cherry Creek on the east of Bear Creek and also the scattered lodgepole and timber pine on top of ridges which was not included in the spring control area.

The spotting was done with a three-man crew, one chief spotter and two spotters. Very few of the 1929 attacks were faded or red-topped and this made spotting difficult. The spotters were trained men, having had previous experience in the spring of 1929. A very thorough check was made of the fall spotting by forest officers and camp foremen and several green-top 1929 attacks were located that had been missed by the spotters.

The burning method of treatment was employed wherever practical. The timber is of the white pine type, averaging about 16 D.B.H. with ground cover of heavy windfalls and underbrush. A single horse was used for skidding and this eliminated a great deal of swamping. As soon as decks of infested logs were completed they were burned. Trees on steep side hills and tops of ridges were hand-logged and burned.

Organization.

Bear Creek Camp consisted of 10 to 14 men with F. M. Akridge a temporary employee as camp manager. Ranger C. D. Soursley was on this job for three weeks, inspecting both spotting and treating and assisting Akridge in supervising the work. Ranger W. M. Gregg made two inspection trips per week while the job was in progress. Ranger E. A. Woods was on the area for six days inspecting and to get a general idea of methods used in white pine insect control.

Seventeen Mile Creek

Seven hundred sixty-five trees were spotted on Seventeen Mile Creek but due to lack of funds only 44 of these were treated. The infestation

in this drainage has reached an epidemic stage. A survey of the area not covered by the 100 per cent spotting was made in October 1929 by Tom Terrell and Ed Henrichs. As a result of this survey it is estimated that there are some 3,200 trees within this drainage which were attacked in 1929.

FALL CONTROL COST BY UNITS

Net pay roll for men and horses other than transportation.	<u>Bear Creek</u> \$1232.00	<u>Quartz Creek</u> \$2296.89	<u>Seventeen Mile</u> \$322.10
Subsistence Supplies	373.89	919.34	90.88
Commissary other than meals	20.70	77.56	13.15
Horse Feed, Shoeing, etc.	16.48	207.12	29.60
Transportation cost.	98.65	163.10	37.50
Equipment & Supplies	65.50	161.54	10.25
Travel Expense	37.40	115.10	21.86
Misc.	15.85	16.00	
Overhead	121.68	261.66	16.70
Total	\$1982.21	\$4218.31	\$542.04
Grand Total	\$6,742.56		

Following table compares the cost of control in the different areas covered by fall control 1929.

COST SUMMARY BY UNITS FALL CONTROL

Unit	No. Trees Basis	Spotting cost per tree	No. Trees Basis	Treating cost per tree	Total of all cost	Bark Sur- face cost per tree.	Bark Sur- face cost per sq. ft.
Bear Creek	309	\$1.26	309	\$2.47	\$6.41	.02597	
Quartz Creek	508	.30	508	3.87	8.33	.02526	
Seventeen Mile	765	.66	44	4.88	12.31	.05946	

The high cost of fall control is due to several factors.

1. The cost of setting up and moving of Seventeen Mile camp and the fact that only a small number of trees were treated.
2. Cost of fall peeling before burning was started.
3. The fact that this was the second season of control on Bear Creek, which resulted in the trees being scattered. Infested trees occurred mostly as singles, there being very few groups of more than three trees in the area. This increased the time required per tree for both the spotting and treating crews. Also much larger acreages were covered than during the spring operation.

PRODUCTION RECORDS AND COSTS
SPOTTING

Spring 1929

<u>Acres</u>	<u>Trees</u>
7960	3067

Fall 1929

<u>Acres</u>	<u>Trees</u>
3680	1538

	<u>Spring</u>	<u>Fall</u>
	<u>1929</u>	<u>1929</u>
Bobtail and Lynx Creek areas not spotted		
Total effective man-days spotting - - - - -	2918	160
Total all man-days spotting - - - - -	3172	172
No. Trees spotted per effective man-days - - - - -	10.52	9.6
" " " " " total " " - - - - -	9.66	9.0
Cost per tree based on effective man-days - - - - -	45.94	49.54
" " " " " total " " - - - - -	49.64	52.64

TREATING

Spring 1929

<u>Acres</u>	<u>Trees</u>
8160	3442

Fall 1929

<u>Acres</u>	<u>Trees</u>
861	861

	<u>Spring</u>	<u>Fall</u>
	<u>1929</u>	<u>1929</u>
Total effective man days treating - - - - -	1876 5/8	692
" All " " " " - - - - -	2595 7/8	1045 1/2
No. Trees treated per effective man-days - - - - -	1.84	1.25
" " " " " total " " - - - - -	1.33	0.82
Cost per tree based on effective man-days - - - - -	\$2.37	3.60
" " " " " total " " - - - - -	\$3.20	5.26

	<u>Spring</u>	<u>Fall</u>
	<u>1929</u>	<u>1929</u>

Actual labor expense both treating and spotting based on effective days work - - - - -	\$2.83	\$4.09
Actual labor expense both treating and spotting based on total man-days chargeable - - - - -	\$3.70	5.78
Total non effective time cost on crews - - - - -	.87	1.69

(The figures being given on a per tree basis)

This non effective time was spent in moving and setting camps, cutting wood, kitchen work, repairing roads and trails, filing saws, repairing tools, etc., all of which are indirectly chargeable to spotting and treating, being necessary in the course of this work.

The foregoing figures cover only the men engaged at the camps. No time of overhead or transportation work is included. All contributed time other than contributed overhead is included.

The amount vouchered against spring 1929 I. C. funds taken from the books is \$16,769.50. At the conclusion of the job subsistence supplies and forage worth \$600.00 were left. These were turned into the forest warehouse as a credit for an equal value to be taken from the warehouse for use in fall work. From this allotment were purchased various amounts of commissary supplies to a total value of \$245.04. Three Hundred Forty-five Dollars and Seventy-three cents worth of commissary items were sold to men. The excess sales or \$100.69 was from commissary stock left over from the Big Hole Insect Control project of the previous spring.

For the fall project \$6,000 was allotted. The credit for the subsistence supplies left over after spring work and amounting to \$600.00 was also applied to the funds for the fall project.

During the summer the salary of Mr. Hendricks was to be paid from insect survey funds. As Mr. Hendricks spent a full month on duties other than insect survey, a credit of \$166.67 was given to fall control project. These items are all set up in the following tabulation of costs. In the tabulation of spring costs, the vouchered amount of spring subsistence is reduced by the value of the supplies left over, or \$600, while the vouchered amount of commissary is increased by the value of the items left from the Big Hole

job and used on this project. The fall costs in the tabulation are likewise arranged to include these adjustments so as to make a better comparison of actual cost between spring and fall work. Contributed time is figured into the total cost of each activity entering into the job. In the spring work this enters only into the overhead, whereas in fall work it enters into the entire payroll as some time was contributed spotting and treating as well as to overhead items.

TABULATION OF COSTS

Based on trees treated Spring 3442
Fall 861

Total cost per tree for entire control operation

Item	Spring 1929	Fall 1929	Spring Total cost	Total cost	1929	Fall 1929
1. Net payroll for men & horses other than Transportation. - - - - -	\$9293.42	\$4038.83	\$2.70		\$4.69	
2. Subsistence supplies - - -	3531.90	1384.11		1.03		1.612
3. Commissary other than for meals. - - - - -	345.73	111.41		.10		.130
4. Horse feed, shosing, etc. - -	215.83	258.20		.063		.295
5. Transportation costs - - - -	1201.23	299.25		.348		.348
6. Equipment & Supplies - - - -	903.76	237.29		.262		.275
7. Travel expense - - - - -	188.03	87.18		.054		.101
8. Misc. Telephone, rent, etc. - -	29.00	31.85		.008		.037
9/ Overhead salaries	1202.81	300.04		.35		.349
Total	<u>\$16,911.71</u>	<u>\$6742.56</u>		<u>\$4,913</u>		<u>\$7,831</u>